

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号
特開2000-225424
(P2000-225424A)

(43) 公開日 平成12年8月15日 (2000.8.15)

(51) Int.Cl.⁷

B 2 1 D 39/03

識別記号

F I

B 2 1 D 39/03

テーマコード(参考)

A

審査請求 未請求 請求項の数 2 O L (全 5 頁)

(21) 出願番号 特願平11-28665

(22) 出願日 平成11年2月5日 (1999.2.5)

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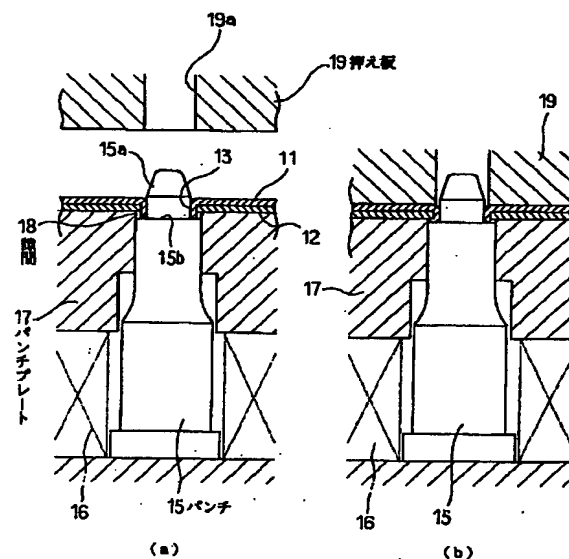
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(54) 【発明の名称】 板材の接合方法と接合装置

(57) 【要約】

【課題】 クラックの発生がなく外観及び強度的にも良好なかしめによる接合を得る。

【解決手段】 接合部材11の中空筒部13を被接合部材12の透孔14に挿通突出せしめ、その突出した筒部を押え板19とパンチ15とで加圧圧潰し、この圧潰部分を被接合部材12の裏面側でパンチ15とパンチプレート17間に形成した隙間に充填するまで加圧展延てかしめ接合する。



11: 接合部材
12: 被接合部材
13: 中空筒部
15a: 頭部
15b: 筒部
16: スプリング (弾性体)

【特許請求の範囲】

【請求項1】 往復移動可能に設けた押え板と、該押え板と対峙して設けたパンチ及び該パンチ外周にスライド可能に設けたパンチプレートとを備え、接合すべき中空筒部を有する被接合部材と透孔を有する被接合部材とを重合して、前記筒部が透孔を挿通突出した状態で前記パンチプレート上にセットし、次いで、その平板状部位を押え板の移動により挟持固定すると共に、前記突出した筒部を押え板と前記パンチとで加圧圧潰し、この圧潰部分を被接合部材の裏面側でパンチとパンチプレート間に形成した隙間に展延し、該隙間が充満するまで加圧してかきめるようにしたことを特徴とする板材の接合方法。

【請求項2】 平板状の被接合部材に中空筒部を形成し、この中空筒部を挿通突出させる透孔を有する被接合部材を重合し、その突出した筒部を加圧圧潰して両接合部材をかきめるようにしたもののにおいて、前記中空筒部内に嵌合する頭部を有するパンチと、該パンチの外側にスライド可能で弾性支持されたパンチプレートと、往復移動可能に設けられ前記パンチプレートとで重合した両接合部材を挟持固定し且つ前記パンチとで突出した筒部を加圧圧潰する押え板とを具備し、前記筒部の圧潰部分を外方に展延すべく被接合部材の裏面とパンチとパンチプレートとの間に連続した隙間を形成したことを特徴とする板材の接合装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、平板状の被接合部材と被接合部材とをかきめて接合する板材の接合方法と接合装置に関する。

【0002】

【従来の技術】 従来、金属平板状の板材をかきめにより接合する手段として、例えば図5に示すように一方の被接合部材1にバーリング加工により中空筒部2を形成し、他方の被接合部材3には前記中空筒部2を挿通突出させる透孔4を形成して、斯かる突出した筒部を加圧変形してかきめる接合手段が多く採用されている。即ち、図6(a)に示す第1工程では接合すべき両被接合部材1、3を重合してセットした後、同図(b)の第2工程において押え板5を下降させてパンチ6との間で加圧し、パンチ5上面に形成した断面半円形状の凹部7で突出した筒部を加圧して外側方にカール状に曲げ加工してかきめ、以って図8に示すように両被接合部材1、3を接合している。

【0003】

【発明が解決しようとする課題】 ところが上記接合手段の場合、中空筒部2は被接合部材3の透孔4より十分に大きく突出させる必要があり、これはパンチ6によるカール状の曲げ加工にて被接合部材3の裏面側に十分に引っ掛かるようにするため、図5に示したように通常、被接合部材1自身の板厚 t の3倍以上の突出高さ h を必要

とされる。従って、この筒部2をバーリング加工により形成する場合、しごき加工により必要な突出高さ h を設けているが、その筒部2の板厚は10～20%程薄く伸ばされ、特に先端部にはV字状のクラック8が発生し易い。このことから延性の高い材料とか、板厚 t を必要以上に大きくしたりする制約や不具合な事情を有する。しかも、かしめ加工の際にも筒部2の側壁は引っ張られるように伸ばされるため、接合完了時にあっても図8に示すようなクラック9が複数箇所発生し易い。従って、このようなクラック9を生じた場合には、強度的にも好ましくないことはもとより、その端部が鋭利であるため手指を怪我するおそれがあり、また外観的にも劣ることは避けられない。

【0004】 本発明は上述の事情に鑑みてなされ、従ってその目的は、クラック発生のおそれもなく均一なかきめ構造を得て、強度的にも外観的にも優れ加工容易な板材の接合方法と接合装置を提供するにある。

【0005】

【課題を解決するための手段】 上記目的を達成するために、本発明の板材の接合方法は、往復移動可能に設けた押え板と、該押え板と対峙して設けたパンチ及び該パンチ外周にスライド可能に設けたパンチプレートとを備え、接合すべき中空筒部を有する被接合部材と透孔を有する被接合部材とを重合して、前記筒部が透孔を挿通突出した状態で前記パンチプレート上にセットし、次いで、その平板状部位を押え板の移動により挟持固定すると共に、前記突出した筒部を押え板と前記パンチとで加圧圧潰し、この圧潰部分を被接合部材の裏面側でパンチとパンチプレート間に形成した隙間に展延し、該隙間が充満するまで加圧してかきめるようにしたことを特徴とする（請求項1の発明）。

【0006】 斯かる接合方法によれば、かしめによる被接合部材への引っ掛かり部分を中空筒部の圧潰により形成し、且つこの圧潰部分を隙間内に加圧展延し充満するようにしたので、このかしめ加工によりクラックの発生はなくて均一な品質にて十分な接合強度が得られると共に生産性に優れ、しかも中空筒部の突出高さも比較的小さくできて材料的な制約も緩和されることから、それだけ設計製作を容易にできる。

【0007】 また、上記目的を達成するために、本発明の板材の接合装置は、平板状の被接合部材に中空筒部を形成し、この中空筒部を挿通突出させる透孔を有する被接合部材を重合し、その突出した筒部を加圧圧潰して両接合部材をかきめるようにしたもののにおいて、前記中空筒部内に嵌合する頭部を有するパンチと、該パンチの外側にスライド可能で弾性支持されたパンチプレートと、往復移動可能に設けられ前記パンチプレートとで重合した両接合部材を挟持固定し且つ前記パンチとで突出した筒部を加圧圧潰する押え板とを具備し、前記筒部の圧潰部分を外方に展延すべく被接合部材の裏面とパンチとパン

チプレートとの間に連続した隙間を形成したことを特徴とする（請求項2の発明）。

【0008】斯かる構成によれば、押え板を駆動して往復移動させることによりかしめ加工ができるので、装置としても複雑化或いは大型化することなく対処でき、しかもかしめ部分を加圧して圧潰展延するための隙間を必要な箇所所望の形状に構成でき、簡単なかしめ加工にて均一で確実な接合状態が得られると共に、外観的にも美麗に仕上げることができる。

【0009】

【発明の実施の形態】以下、本発明の板材の接合方法と接合装置を示す一実施例につき、図1乃至図4を参照して説明する。まず図2は、接合すべき平板状の接合部材11と被接合部材12の接合前の形状を示したもので、これら両接合部材11、12の板厚 t_1 、 t_2 は略同等とする金属板で、接合部材11には所望の接合箇所にバーリング加工により突設された円筒状の中空筒部13を有し、その高さ h_1 は上記2枚の板厚($t_1 + t_2$)より大きく形成され、一方、被接合部材12には上記筒部13が嵌挿する円形の透孔14を形成している。

【0010】そして、図1は上記両接合部材11、12をかしめ加工する工程手順と接合装置の一部を示したもので、15は図示しない基台上に固定された円柱状のパンチで、その上部には前記中空筒部13内に嵌合する頭部15a、及びこれと段差をなした平面状の肩部15bを環状に形成している。そして、このパンチ15の周側に上下方向にスライド可能に挿着され、底部に弾性体たるスプリング16を介して弾性支持されたパンチプレート17が設けられていて、同図(a)に示す常態においてこの上部内側面とパンチ15の外側面である肩部15bとの間に凹状の隙間18を環状に形成している。

【0011】このようなパンチ15とパンチプレート17の上方に対峙して、昇降可能な押え板19が設けられており、これは図示しないシリンダ機構などに連動して往復移動するもので、その中央部位は下降時に前記パンチ15の頭部15aと当接しないように逃げ穴19aが形成されている。尚、図3及び図4は、夫々両接合部材11、12のかしめ加工後における接合状態を示す裏面側から見た外観斜視図及び断面図である。

【0012】上記のように構成された本実施例の接合手段につき、図1に示す工程手順に沿って説明する。まず、図1(a)の第1工程では、押え板19が上昇位置の待機状態にあって、接合すべき接合部材11を上側にして被接合部材12と重合して、中空筒部13が透孔14を挿通し該筒部13が下方に突出した状態でパンチプレート17上に載置される。この場合、パンチ15の頭部15aが筒部13の中空部と嵌合することで位置決めされ所定位置にセットされる。

【0013】次いで、同図(b)の第2工程では、図示しないシリンダ機構などの駆動により押え板19が直線

的に下降し、両接合部材11、12はその平板状部位がパンチプレート17との間で挟持固定される。そして押え板19の下降が続き、パンチプレート17と共にそのスプリング16の弾性力に抗して押し下げていく。これと略並行して中空筒部13の突出端部はパンチ15の肩部15bにて衝止されて下降移動できないため、押え板19と肩部15bとの間ですえ込みされるように圧潰されて外方の隙間18内に展延され、所謂かしめ加工が行われる。そして更に続く押え板19の下降により縮小化していく隙間18内が圧潰部分で充満するまで加圧され、充満してそれ以上の下降が実質的に不可となった後、押え板19は上昇復帰する。しかるにこのかしめ加工により展延された板厚 t_3 は、接合部材11の板厚 t_1 の約 $1/2$ となるように隙間18容積が設定されており、この板厚 t_3 は機械的強度及び外方へ展延して被接合部材12の裏面側への引っ掛かり分を十分に確保すべく設計製作的に求められる。しかして上記かしめ加工を終えた両接合部材11、12は、図3及び図4に示すような密着した接合状態となり、中空筒部13端部のかしめ加工により圧潰された部分の外観形状は、クラックとか不規則な凹凸がない環状突部の形状に成形される。

【0014】上記述べたように本実施例によれば、駆動されて昇降する押え板19の所謂直線的な往復移動に伴い、接合部材11と被接合部材12とのかしめ加工を行い簡単な工程にて接合できることはもとより、特に圧潰展延部分を隙間18内に充満するようにしたので、斯かるかしめ部分にはクラックの発生がなく美麗に仕上げることができ、従って手指が触れて怪我するおそれもなく、且つ外観を損ねることもない。しかも、中空筒部13の突出高さ h_1 も接合部材11の板厚 t_1 の2倍程度で十分な引っ掛かりと接合強度が得られ、従来に比し材料選択の利用範囲が拡大し、この点からも設計製作を容易にする。また、隙間18の大きさもパンチ15とパンチプレート17の簡単な構成にて容易に形成できる等、種々の実用的効果を奏する。

【0015】尚、上記実施例では中空筒部13は円筒状としたが、その他、長円形ほか非円形にすることも可能で、斯かる場合には1箇所の接合部分において2枚の接合部材の回動方向への滑りを確実に阻止できるなど、上記し且つ図面に示した各実施例に限定されるものではなく、本発明の要旨を逸脱しない範囲内にて適宜変更して実施できるものである。

【0016】

【発明の効果】本発明は以上説明した通り、接合部材に中空筒部の形成時、或いは接合過程におけるクラックの発生を抑制でき、従って接合状態の外観的仕上がりも美麗で怪我などに対する安全性も増すばかりか、均一な品質のもと十分な接合強度が得られ、しかも接合部材の中空筒部を圧潰展延して充満せる隙間構成も複雑化を抑えて、その設計製作が容易で且つ簡易な接合手段にて生産

性にも優れた板材の接合方法と接合装置を提供できる。

【図面の簡単な説明】

【図 1】 本発明の一実施例を示す工程図

【図 2】 接合前の 2 枚の板材の構成を示す斜視図

【図 3】 接合状態を示す外観斜視図

【図 4】 接合状態を示す断面図

【図 5】 従来例を示す接合前の 2 枚の板材の断面図

【図 6】 図 1 相当図

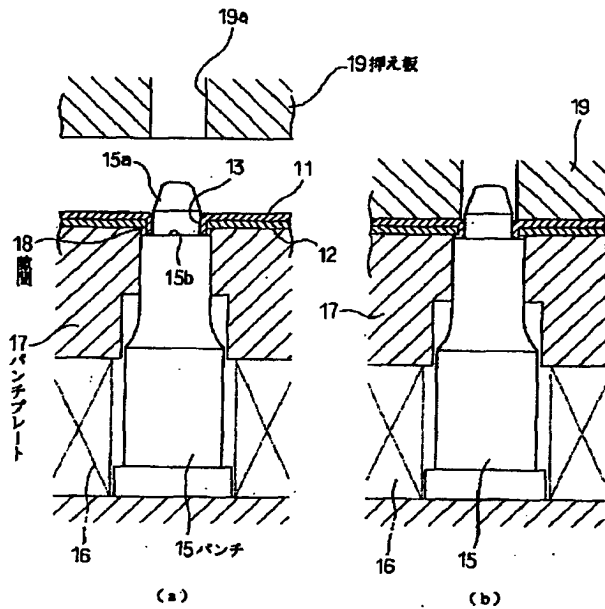
【図 7】 接合前の板材の異なる態様を示す斜視図

【図 8】 図 3 相当図

【符号の説明】

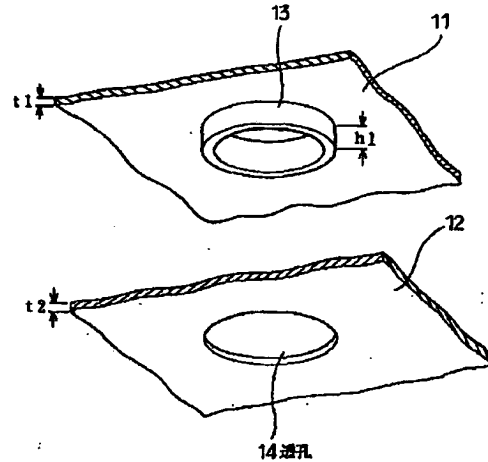
11 は接合部材、12 は被接合部材、13 は中空筒部、14 は透孔、15 はパンチ、15a は頭部、15b は肩部、16 はスプリング（弾性体）、17 はパンチプレート、18 は隙間、及び 19 は押え板を示す。

【図 1】

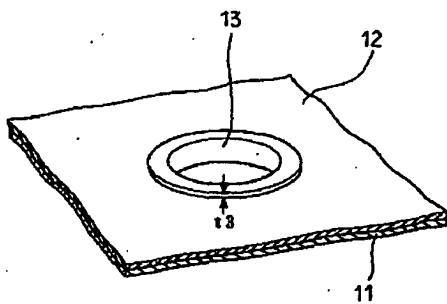


11: 接合部材
12: 被接合部材
13: 中空筒部
15a: 頭部
15b: 肩部
16: スプリング（弾性体）

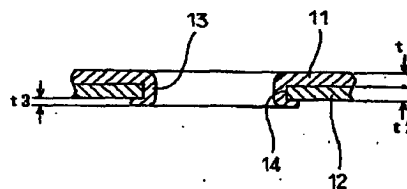
【図 2】



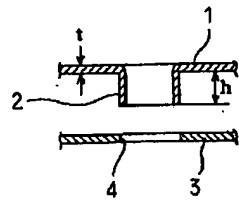
【図 3】



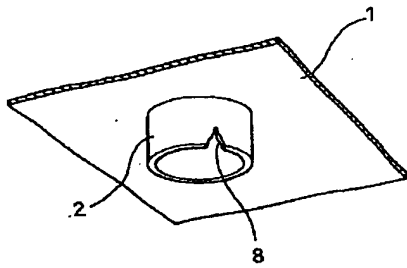
【図 4】



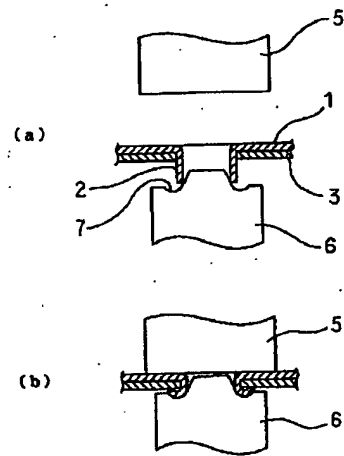
【図5】



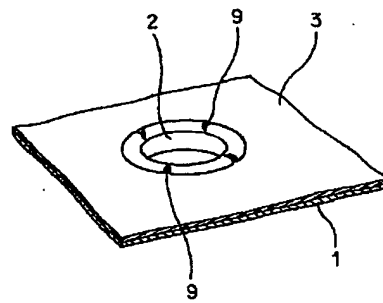
【図7】



【図6】



【図8】



PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-225424

(43)Date of publication of application : 15.08.2000

(51)Int.Cl.

B21D 39/03

(21)Application number : 11-028665

(71)Applicant : TOSHIBA CORP

(22)Date of filing : 05.02.1999

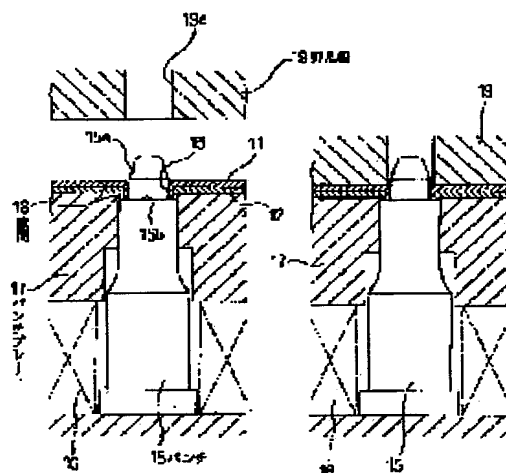
(72)Inventor : MIYAZAKI MASAJI

(54) JOINING METHOD AND JOINING DEVICE FOR METAL PLATE

(57)Abstract:

PROBLEM TO BE SOLVED: To execute joining excellent in strength and appearance without developing cracks by clamping and fixing a planar part by the movement of a press plate, crushing a projected cylindrical part with a press plate and a punch, spreading the crushed part in a clearance formed between the punch and a punch plate and calking it till the clearance is filled up.

SOLUTION: A joining member 11 and member 12 to be joined are superposed, the hollow cylindrical part 13 penetrates a through hole and, in a state where the cylindrical part 13 is downward projected, it is placed on a punch plate 17. The press plate 19 is lowered, the joining member 11 and member 12 to be joined are clamped and fixed between itself and the punch plate 17 and they are pushed down together the punch plate 17 against the elastic force of a spring 16. By crushing the projected end part of the hollow cylindrical part 13 between the press plate 19 and the shoulder part 15b, spreading in the outside clearance 18 and calking it, it is pressurized till the clearance 18 is filled up with the crushed part. In this way, the calking is executed by a simple process, the cracks are not developed and sufficient catching and bonding strength are obtained.



LEGAL STATUS

[Date of request for examination]

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[Date of final disposal for application]

[Patent number]

[Date of registration]

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[Date of requesting appeal against examiner's
decision of rejection]

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3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The polymerization of the joint material and the joint-ed material which has a bore characterized by providing the following is carried out, and the aforementioned cylinder part sets a bore on the aforementioned punch plate, where an insertion protrusion is carried out. subsequently While carrying out pinching fixation of the plate-like part by movement of a pressure plate, pressurization crash of the cylinder part which carried out [aforementioned] the protrusion is carried out by the pressure plate and aforementioned punch. until it spreads this crash portion in the crevice formed between punch and the punch plate by the rear-face side of joint-ed material and this crevice is filled with it -- pressurizing -- the junction method of the plate characterized by making it close The pressure plate prepared possible [both-way movement]. The hollow cylinder part which should be equipped with the punch plate which stood face to face against this pressure plate, and was prepared possible [the formed punch and a slide on this punch periphery], and should be joined.

[Claim 2] It has the following and is characterized by forming the crevice which continued between the rear face of joint-ed material, punch, and the punch plate that the crash portion of the aforementioned cylinder part should be spread to the method of outside. What forms a hollow cylinder part in plate-like joint material, carries out the polymerization of the joint-ed material which has the bore which carries out insertion projection of this hollow cylinder part, carries out pressurization crash of the projected cylinder part, and closed both joint material. Punch which has the head which fits in in the aforementioned hollow cylinder part. The punch plate by which could slide to the outside of this punch and the elastic support was carried out. The pressure plate which carries out pressurization crash of the cylinder part which carried out pinching fixation of both the joint material that it was prepared possible [both-way movement] and carried out the polymerization by the aforementioned punch plate, and was projected by aforementioned punch.

[Translation done.]

* NOTICES *

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the junction method of a plate and junction equipment which join plate-like joint material and plate-like joint-ed material in total.

[0002]

[Description of the Prior Art] the bore 4 which the hollow cylinder part 2 is formed [bore] in the joint material 1 by burring as while shows conventionally drawing 5 as a means to join a metal plate-like plate by the caulking, and makes the joint-ed material 3 of another side carry out the insertion protrusion of the aforementioned hollow cylinder part 2 -- forming -- this protrusion -- the bottom -- a cylinder part -- pressurization deformation -- carrying out -- many junction meanses to close are adopted Namely, after carrying out the polymerization of both the joint material 1 and 3 that should be joined at the 1st process shown in drawing 6 (a) and setting it, As drop a pressure plate 5 in the 2nd process of this drawing (b), pressurize between punch 6, the cylinder part projected in the crevice 7 of the shape of a cross-section semicircle formed in the punch 5 upper surface is pressurized, bending is carried out to the method of an outside at the letter of curl and it is shown in a caulking and ***** drawing 8 , both the joint material 1 and 3 is joined.

[0003]

[Problem(s) to be Solved by the Invention] However, when it is the above-mentioned junction means, it is necessary to make the hollow cylinder part 2 project more greatly enough than the bore 4 of the joint-ed material 3, and this is for making it fully caught in the rear-face side of the joint-ed material 3 in bending of the letter of curl by punch 6, and as shown in drawing 5 , projection height h of 3 times or more of the board thickness t of joint material 1 self is usually needed for it. Therefore, although required projection height h is prepared by ironing when forming this cylinder part 2 by burring, the board thickness of the cylinder part 2 is lengthened thinly about 10 to 20%, and the V character-like crack 8 tends to generate it especially in a point. It has from this **** which are a ductile high material, and the restrictions and fault which make board thickness t larger than required. And since it is lengthened so that the side attachment wall of a cylinder part 2 may be pulled also in the case of caulking, even if it is at the time of the completion of junction, it is easy to generate the crack 9 as shown in drawing 8 in two or more places. Therefore, when such a crack 9 is produced, it is not avoided that that it is not desirable in intensity has a possibility that a finger may be injured since the edge is sharp, from the first, and it is inferior also in appearance.

[0004] do this invention in view of an above-mentioned situation -- therefore, the purpose -- the anxiety of crack initiation -- there is nothing -- the bundle structure in uniform -- obtaining -- intensity ---like -- appearance ---like -- excelling -- processing -- it is in offering the junction method of an easy plate, and junction equipment

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the junction method of the plate of this invention The polymerization of the joint material which is equipped

with the punch plate prepared possible [the punch which stood face to face against the pressure plate prepared possible / both-way movement / and this pressure plate, and was formed, and a slide on this punch periphery], and has the hollow cylinder part which should be joined, and the joint-ed material which has a bore is carried out. The aforementioned cylinder part sets a bore on the aforementioned punch plate, where insertion projection is carried out. subsequently While carrying out pinching fixation of the plate-like part by movement of a pressure plate, pressurization crash of the cylinder part which carried out [aforementioned] projection is carried out by the pressure plate and aforementioned punch. until it spreads this crash portion in the crevice formed between punch and the punch plate by the rear-face side of joint-ed material and this crevice is filled with it -- pressurizing -- it is characterized by making it close (invention of a claim 1)

[0006] Since the connection portion to the joint-ed material by the caulking was formed by crash of a hollow cylinder part, and pressurization spreading is carried out and it was made to be filled with this crash portion in a crevice according to this junction method Design manufacture can be made easy so much from excelling in productivity, while there is no generating of a crack and bonding strength sufficient in uniform quality is obtained by this caulking, and the protrusion height of a hollow cylinder part being also comparatively small, being able to do moreover, and material-restrictions being eased.

[0007] In order to attain the above-mentioned purpose, moreover, the junction equipment of the plate of this invention In what forms a hollow cylinder part in plate-like joint material, carries out the polymerization of the joint-ed material which has the bore which carries out the insertion protrusion of this hollow cylinder part, carries out pressurization crash of the projected cylinder part, and closed both joint material The punch which has the head which fits in in the aforementioned hollow cylinder part, and the punch plate by which could slide to the outside of this punch and the elastic support was carried out, The pressure plate which carries out pressurization crash of the cylinder part which carried out pinching fixation of both the joint material that it was prepared possible [both-way movement] and carried out the polymerization by the aforementioned punch plate, and was projected by aforementioned punch is provided. It is characterized by forming the crevice which continued between the rear face of joint-ed material, punch, and the punch plate that the crash portion of the aforementioned cylinder part should be spread to the method of outside (invention of a claim 2).

[0008] Since according to this composition a pressure plate is driven and caulking is possible by carrying out both-way movement, while being able to cope with it, without complicating or enlarging also as equipment, being able to constitute to the configuration of the request [crevice / for pressurizing a caulking portion moreover and carrying out crash spreading] by the required part and acquiring a uniform and positive junction state by bundle processing in easy, it can finish in appearance and beautiful.

[0009]

[Embodiments of the Invention] Hereafter, it explains with reference to drawing 1 per [which shows the junction method of the plate of this invention, and junction equipment] example, or drawing 4 . Drawing 2 is what showed the configuration before junction of the plate-like joint material 11 which should be joined, and the joint-ed material 12 first. The board thickness $t1$ of both [these] the joint material 11 and 12, and $t2$ It is the metal plate made into an abbreviation EQC. In the joint material 11, it has the hollow cylinder part 13 of the shape of a cylinder which protruded on the desired junction part by burring, and is the height $h1$. It is formed more greatly than the board thickness ($t1+t2$) of the two above-mentioned sheets, and, on the other hand, the circular bore 14 which the above-mentioned cylinder part 13 fits in is formed in the joint-ed material 12.

[0010] And drawing 1 is what showed some of process procedures which caulk both the above-mentioned joint material 11 and 12, and junction equipments, and 15 is punch of the shape of a pillar fixed on the pedestal which is not illustrated, and forms annularly in the upper part head 15a which fits in in the aforementioned hollow cylinder part 13, and shoulder 15b of the plane which made this and the level difference. And it is inserted in the periphery side of this punch 15 possible [a slide in the vertical direction], the punch plate 17 by which the elastic support was

carried out to the pars basilaris ossis occipitalis through the elastic body slack spring 16 is formed, and the concave crevice 18 is annularly formed in the ordinary state shown in this drawing (a) between shoulder 15b which is this up medial surface and the lateral surface of punch 15.

[0011] It confronts above such punch 15 and a punch plate 17 each other, and the pressure plate 19 which can go up and down is formed, this is interlocked with the cylinder style which is not illustrated and does not carry out both-way movement, and clearance-hole 19a is formed so that the center-section grade may not contact head 15a of aforementioned punch 15 at the time of descent. In addition, drawing 3 and drawing 4 are both the joint material 11, the appearance perspective diagram seen from the rear-face side which is made to go away 12 and shows the junction state after processing, and a cross section, respectively.

[0012] Along with the process procedure shown in drawing 1, it explains about the junction means of this example constituted as mentioned above. First, at the 1st process of drawing 1 (a), a pressure plate 19 is in the standby state of a rise position, the joint material 11 which should be joined is turned up, and a polymerization is carried out to the joint-ed material 12, and after the hollow cylinder part 13 inserted in the bore 14 and this cylinder part 13 has projected below, it is laid on a punch plate 17. In this case, it is positioned because head 15a of punch 15 fits in with the centrum of a cylinder part 13, and it is set to a predetermined position.

[0013] Subsequently, at the 2nd process of this drawing (b), a pressure plate 19 descends linearly by the drive of the cylinder style which is not illustrated, and, as for both the joint material 11 and 12, pinching fixation of the plate-like part is carried out between punch plates 17. And descent of a pressure plate 19 continues, and with the punch plate 17, the elastic force of the spring 16 is resisted and it depresses. It carries out [abbreviation] with this, the protrusion edge of the hollow cylinder part 13 is fixed in shoulder 15b of punch 15, since downward movement cannot be carried out, it is between a pressure plate 19 and shoulder 15b, and it is crashed so that swaging may be carried out, and it is spread in the crevice 18 between the methods of outside, and the so-called caulking is performed. And after being pressurized, being full and the descent beyond it becoming improper substantially until the inside of the crevice 18 reduction-ized by descent of the pressure plate 19 which continues further is filled with a crash portion, a pressure plate 19 carries out an elevation return. however, board thickness t3 spread by this caulking Board thickness t1 of the joint material 11 about — crevice 18 capacity sets up so that it may be set to one half — having — **** — this board thickness t3 It spreads to a mechanical strength and the method of outside, and asks in design manufacture that a part for the connection by the side of the rear face of the joint-ed material 12 should fully be secured. Both the joint material 11 and 12 that carried out the deer and finished the above-mentioned caulking will be in the stuck junction state as shown in drawing 3 and drawing 4, and the appearance configuration of the portion crashed by caulking of hollow cylinder part 13 edge will be fabricated by the configuration of an annular projected part without a crack or irregular irregularity.

[0014] According to this example, it follows on the so-called linear both-way movement of the pressure plate 19 which was described the account of a top and which drives and goes up and down like. Since it was made to be filled not only with especially the thing that it is processed by making it going away with the joint material 11 and the joint-ed material 12, and can be joined at an easy process but also a crash spreading portion in a crevice 18 There is no generating of a crack in this caulking portion, and it can finish beautiful, there is also no possibility that a finger may touch and it may be injured, and appearance is not spoiled. And protrusion height h1 of the hollow cylinder part 13 Board thickness t1 of the joint material 11 Connection and a bonding strength sufficient by the double-precision grade are obtained, it compares with the former, the use range of material selection is expanded, and design manufacture is made easy also from this point. Moreover, various practical effects — the size of a crevice 18 can also be easily formed with the easy composition of punch 15 and a punch plate 17 — are done so.

[0015] In addition, within limits which are not limited to each example which described above that the hollow cylinder part 13 was possible also for making it a non-round shape besides an ellipse although considered as the shape of a cylinder, and could prevent certainly slipping to the

rotation direction of the joint material of two sheets in one joint in this case etc., and was shown in the drawing, and do not deviate from the summary of this invention in the above-mentioned example, it changes suitably and can carry out.

[0016]

[Effect of the Invention] this invention can suppress generating of the crack in the time of formation of a hollow cylinder part, or junction process to joint material as it was explained above. therefore, [that an appearance-result of a junction state and safety / as opposed to / it is beautiful and / an injury etc. / increase, and] Sufficient bonding strength is obtained also with uniform quality, moreover crash spreading of the hollow cylinder part of joint material is carried out, fullness **** crevice composition also suppresses complication and the junction method of the plate the design manufacture excelled [plate] also in productivity with the easy and simple junction means, and junction equipment can be offered.

[Translation done.]